NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

ORIGINAL

August 19, 1997

Addendum 1 to
Group Chairmen's Factual Report

OPERATIONAL FACTORS/HUMAN PERFORMANCE

DCA97MA017

A. ACCIDENT

Operator:	COMAIR, Inc.
Location:	Monroe, Michigan
Date:	January 9, 1997
Time:	1554 Eastern Standard Time (EST)[1]
Airplane:	EMB-120RT, N265CA Serial Number 1257

B. OPERATIONS GROUP

Captain David J. Ivey
Operations Group Chairman (AS-30)
National Transportation Safety Board
Washington, D.C. 20594

Captain Wayne A. Wolke
COMAIR, Inc.
Greater Cincinnati Airport
P. O. Box 75021
Cincinnati, OH 45021

William G. Plessinger, ASI
Federal Aviation Administration
3939 International Gateway
Columbus, OH 43219

Captain Kevin McGreevy
Air Lines Pilots Association
8100 Burlington Pike, Suite 280
Florence, KY 41042

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[1] All times are Eastern Standard Time based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate, determined by the Flight Data Recorder (FDR) and Air Traffic Control (ATC) transcript.

Barry Strauch,
Chief, Human Performance Division
National Transportation Safety Board
Washington, D.C. 20594

Evan A. Byrne
Human Performance Investigator
National Transportation Safety Board
Washington, D.C. 20594

Mark W. Lowell[2]
Embraer Aircraft Corporation
276 S. W. 34th Street
Ft. Lauderdale, FL 33315

D. ERRATA and ADDENDA

Errata:

Ralph P. McWhorter reviewed a summary of his statement and submitted the following correction:

page 19.

Replace the word "engine" with the word "igniters" in the sentence "...you have to use the igniter to clear the engine of moisture,...." The sentence is in the next to last paragraph on the page

Addenda:

Attached are statements submitted by COMAIR personnel with corrections to summaries of their statements. These individuals were interviewed by the Operations/Human Performance Group and reviewed their statements based upon the Operations/Human Performance Group Chairman's Factual Report, dated April 25, 1997.

The corrections are included as Attachments 79-89.

Excepts from the EMB-120 Airplane Flight Manual, specifically Revision 27 pertaining to page 4-39 which was current prior to the issuance of Revision 43. Also included is Revision 43. The pages are Attachments 90-93.

Excerpts from the FAA Order 8400.10 Air Transportation Operations Inspector's Handbook. Chapter 15, Section 4, Paragraphs 2163-2169. The pertinent pages 3-2095, 3-2096 and 3-2097 pertaining to these paragraphs are included as Attachments 94-97.

Submitted by:
David J. Ivey ASI, AS-30

AS-30 8-20-97

[2] Mr. Lowell joined the Operations Group as a member on April 3, 1997 and participated in the simulator and interview activities on that date.

Comair
Delta Connection

May 23, 1997

Mr. Richard G. Rodriguez
Investigator-in-Charge
Office of Aviation and Safety (AS-10)
490 L'Enfant Plaza East, SW
Washington, DC 20594-2000

Dear Dick:

As requested, we are in the process of reviewing the group factual reports you've sent, in anticipation of the technical review meeting.

I've had our people review the proposed summary of their statements and have enclosed their corrections. We request these corrected versions, which more accurately reflect what our people said, be substituted for the first drafts.

With best regards,

Ken Marshall
Vice President, Flight Operations

KM/jwr

Enclosures

COMAIR

Flight Operations Memo

DATE: May 16, 1997

TO: Kenneth W. Marshall

FROM: Richard St. Onge, Jr.

SUBJECT: Corrections to NTSB Statement

The following are the corrections to my NTSB Statement:

1. *Page 24, Paragraph 2, is only correct through the fourth sentence. The remainder of the paragraph should read*: "He was an EMB 110 FO, SF340 FO, EMB110 Captain, SA227 Captain, SA227 Instructor, SA227 Program Manager, RJ Program Manager, Chief Pilot, and was then appointed Director of Operations."

2. *Page 24, paragraph 3, the sentence* 2: delete, this was not my statement.

3. *Page 24, paragraph 4, the sentence 2 should read*: "He wanted someone with a fresh approach to the job."

4. *Page 24, paragraph 4, the sentence 3*: delete, this was not my statement.

5. *Page 24, paragraph 4, the sentence 4 should read*: "There has been no turnover since then."

6. *Page 25, paragraph 4, the last sentence should read*: "IOE are FAR minimums, but they must meet proficiency requirements determined by the company."

7. *Page 25, paragraph 5, sentence 1 should read*: "Minimum qualifications for employment are 1,200 hours total time and 200 hours multi-engine time for those who are selected from the AQP pool."

Comair

INTER-OFFICE MEMO

TO: Kenneth W. Marshall,
Vice President - Flight Operations

DATE: May 8, 1997

FROM: Richard E. Sykes,
Captain - Canadair Regional Jet

FILE NO.: 97050001

SUBJECT: Corrections to NTSB Statement

Following are my corrections to my NTSB statement:

① *Page 41, paragraph 2, line 3:* "When something is revised..." should read "When a revision is made to the Pilot Training Manual, the entire manual is reprinted to reduce the confusion of tracking revised pages."

② *Page 42, paragraph 3, line 2:* "Does not mean..." should read "The autopilot will command the ailerons to a roll in the opposite direction in an attempt to prevent the aircraft from exceeding the maximum bank for the mode being utilized."

③ *Page 42, paragraph 6, line 2:* "Pilots with acrobatic experience..." should read "Pilots with acrobatic experience usually perfom better on the unusual attitude training."

④ *Page 43, paragraph 1, line 8:* "...should disengage..." should read ""...will disengage..."

⑤ *Page 43, paragreaph 4, line 6:* "If you bring power levers..." should read "If you bring power levers below flight idle, it would cause an overspeed, however the aircraft is equipped with a flight idle latching mechanism to prevent inadvertant placement of power levers below flight idle while airborne. The pilots are also trained to never bring the power levers below flight idle until all three landing gear are on the ground."

[redacted]

Comair

INTER-OFFICE MEMO

TO: Kenneth W. Marshall,
Vice President - Flight Operations

DATE: May 8, 1997

FROM: Wayne A. Wolke,
EMB-120 Program Manager

FILE NO.: 97050002

SUBJECT: Corrections to NTSB Statement

Following are my corrections to my NTSB statement:

① *Page 64, paragraph 1, line 6:* "...became a Check Airman..." should read "...became a Check Airman and Designated Examiner..."

② *Page 64, paragraph 2, line 3:* "...to be type rated..." should read "...to be line qualified..."

COMAIR

INTER-OFFICE MEMO

DATE: May 12, 1997

TO: Kenneth W. Marshall

FROM: Matt Jacobs

SUBJECT: Corrections to NTSB Statement

Following are my corrections to my NTSB Statement:

1. *Page 55, paragraph 3, first sentence:* "...do preflights, engine checks, engine checks, two engine ILS..."

2. *Page 56, paragraph 2, last sentence should be deleted:* I did not make this statement. There is no published minimum clean speed.

3. *Page 56, paragraph 9, should read:* "...among captain's side, first officer's side.

COMAIR

INTER-OFFICE MEMO

DATE: May 12, 1997

TO: Kenneth W. Marshall

FROM: Keith Stamper [redacted]

SUBJECT: Corrections to NTSB Statement

The following are corrections to my NTSB statement:

Page 45, paragraph 2, sentence 2, should read: "They were in a recurrent ground school I taught..."

Page 45, paragraph 8, 2nd sentence should read: "The only speed published with reference to icing is 160 in holding. We train to hold at 170 period (icing or not.).

Page 45, paragraph 10, first sentence should read: "The slow fast indicator was only certified for flaps zero and 45."

Page 46, paragraph 5, sentence 3 should read: "The non-flying pilot will then call V2 + 20..."

Page 47, paragraph 3, first sentence should read: "In severe icing conditions...

Page 47, paragraph 3, fourth sentence should be deleted: I did not say that in reference to the holding speed.

Page 48, paragraph 5, should read: I did not make this statement, however, relative to that statement, I did say, "I did not know if the fast slow indicator was an instrument that needs calibration.

Page 48, last paragraph should read: I did not make this statement. My definition of masking was, "The auto pilot will fight a tendency to turn. When it finally disconnects, the aircraft will tend to snap

COMAIR

INTER-OFFICE MEMO

DATE: May 12, 1997

TO: Kenneth W. Marshall

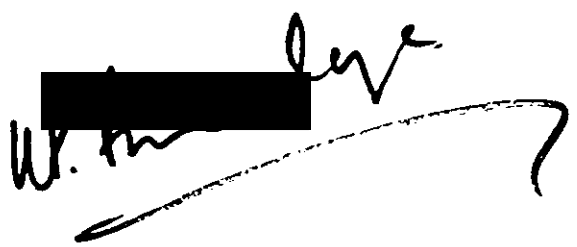
FROM: William Brundage

SUBJECT: Corrections to NTSB Statement

The following are my corrections to my NTSB Statement:

1. *Page 30, paragraph 2, last sentence should read:* "He then returned to CVG."

2. *Page 30, paragraph 3, fourth sentence should read:* "He had also flown the SF-340, EMB-110, EMB-120, and RJ.



COMAIR

INTER-OFFICE MEMO

DATE: May 10, 1997

TO: Kenneth W. Marshall

FROM: Jordan Brooks

SUBJECT: Corrections to NTSB Statement

The following are my corrections to the my NTSB statement:

1. *Page 49, paragraph 2 should read:* "Spent 9 ½ years in photogrammetry field, 4 years, Navy photographer.

2. *Page 49, paragraph 3 should read:* "No formal training in CRM 93."

3. *Page 49, paragraph 4, last sentence should read:* "They have also done one on one CRM training, through the Chief Pilots office, with individual crewmembers based on observations during training..."

4. *Page 49, paragraph 6, last sentence should read:* "Also attended Northwest Airline's Instructor Refresher Program."

5. *Page 49, paragraph 9, second sentence should read:* "Dave Harris and Ken Marshall spearheaded CRM here at COMAIR.

6. *Page 50, paragraph 7, third sentence should read:* "Last module, for both F/As as well is stress."

Clarification to statement of David Yetley:

On the second page of my statement, pg. 17 of the summary, first paragraph, 2nd. Sentence third line, the statement reads, "they flew no legs into DTW, and had flown no legs into DTW on any of the previous flights". The statement I made was that I was not sure if I had flown any previous flights into DTW with Captain Carlsen, and that I would have to check my log book.

Further in same paragraph, I made no statement about a 45degree intercept angle to the localizer. If I had mentioned any degree of angle it would most likely have been a 30 degree angle, which is typically what we make.

In all other respects the statement is an accurate summary of my interview to the NTSB.

Signed this 22nd of May

David B. Yetley

DATE: May 16, 1997

TO: Kenneth W. Marshall

FROM: Captain James Watson JW

SUBJECT: Corrections to NTSB Statement

The following are the corrections to my NTSB Statement

1. *Page 13, paragraph 5, 4th sentence should read:* "He used the auto-pilot on most approaches but turned it off occasionally, in order to hand fly it."

2. *Page 13, paragraph 9, 3rd sentence should read:* "You have to trim the rudder a lot in the airplane. Every time you change power, you trim the rudder."

3. *Page 14, paragraph 2 should read*: "In unusual altitude training, when the aircraft rolls over, add power, step on the rudder and roll wings level. The aircraft responds well."

4. *Page 15, paragraph 2, 1st sentence should read*: "On the last trip to CVG, he experienced ice and turbulence, normal for that time of year."

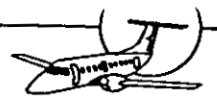
5. *Page 15, paragraph 3, 3rd sentence should read:* "If you are flying above 180 knots, the auto-pilot may have trouble intercepting."

Clarification to Statement Captain Charles A. Briggs:

I have reviewed the statement I gave to the NTSB on January 11,1997 and I it is an accurate summary of my interview on that date except that I would add on page 2 of my statement (page 23 of the summary), 5th paragraph, 4th sentence, the word "final" after "on" and before "approach". The sentence should read : "Those speeds would normally be on final approach....."

Signed this 22nd day of May 1997:

[redacted]
Charles A. Briggs



CTA APPROVED AIRPLANE FLIGHT MANUAL
(AFM-120/794)

LOG OF REVISIONS

REVISION NUMBER AND DATE	REVISED PAGES	DESCRIPTION OF REVISION	CTA APPROVAL	
			DATE	SIGNATURE
43 Apr 23, 1996	2-13 and 4-39	Improve Operation in Icing Conditions information.	23 APR, 96	
44 Oct 14, 1996	4-3	Delete electrical emergency switching daily check.	14 OCT, 96	
45 Oct 14, 1996	3-15, 3-49, 3-50, 3-50A, 3-56 and 3-56A	Update Abnormal Landing Gear Extension procedure.	14 OCT, 96	
46 Oct 14, 1996	S-i, S11-iii to S11-14	Include Supplement 11 – Ferry Flight with Landing Gear Down.	14 OCT, 96	
47 Oct 14, 1996	3-8, 3-8A, 3-56, 3-69, 4-9 and 4-19 5-8 Appendix 1 A1-iii and 6-1	Include, update and improve emergency, abnormal and normal procedures. Update performance information. Update CDL items.	14 OCT, 96	
48 Oct 14, 1996	2-13, 2-14, 4-39 and 4-40	Update flight in icing conditions (SLD) information.	14 OCT, 96	
49 Jan 06, 1997	3-45, 3-46, 3-49, 3-50, 3-50A and 3-50B	Update flaps abnormal procedures.	6 JAN, 97	

CTA APPROVED
APRIL 23, 1996
REV. 49 – JANUARY 06, 1997

-90-

OPERATION IN ICING CONDITIONS

When flying into known or forecast icing conditions, proceed:

IGNITION Switches ..... ON

Ice Protection System ..... TURN ON AS REQUIRED

The ice protection system should be turned on as follows:

- AOA, TAT and SLIP: before flying into known icing conditions.
- Propeller: before flying into known icing conditions or at the first sign of ice formation.
- Engine air inlet and windshield: at the first sign of ice formation.
- Wing and tail leading edges: when ice accumulation is 1/4" to 1/2 ".

Holding configuration:

Landing Gear Lever ..... UP

Flap Selector Lever ..... UP

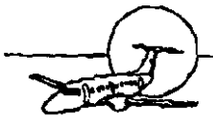
Airspeed ..... 160 KIAS MINIMUM

Np ..... 85% MINIMUM

To eliminate propeller vibrations, increase Np as required.

NOTE: For approach procedures in known or forecast icing conditions, increase the airspeed by 5 up to 10 KIAS until the short final.

– OPERATION IN ICING CONDITIONS CHECKLIST COMPLETED –



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Holding configuration:

Landing Gear Lever ..... UP

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Airspeed ..... 160 KIAS MINIMUM

Np ..... 85% MINIMUM

To eliminate propeller vibrations, increase Np as required.

NOTE: For approach procedures in known or forecast icing conditions, increase the airspeed by 5 up to 10 KIAS until the short final.

– OPERATION IN ICING CONDITIONS CHECKLIST COMPLETED –

FLIGHT CREW

– Required Flight Crew ..... Pilot and Copilot

KINDS OF OPERATION

The airplane is certificated in the transport category (passengers and cargo), in the following conditions, both day and night, when the appropriate equipment and instruments required by the airworthiness and operating regulations are approved, installed and in an operable condition:

– Visual (VFR);

– Instrument (IFR);

– Icing Conditions.
In icing conditions, use of flaps is restricted to takeoff, approach, and landing only. When the flaps have been extended for approach or landing, they may not be retracted unless the upper surface of the wing aft of the protected area is clear of ice, or unless flap retraction is essential for go-around.

MANEUVERING FLIGHT LOAD FACTORS LIMIT

– – 1 g to + 2.80 g with flaps retracted.

– 0 g to 2.00 g with flaps extended.

NAVIGATION AND COMMUNICATION EQUIPMENT

– Do not operate weather radar during refueling near fuel spills or people.

– The airplane must not be moved until all heading and attitude information is valid on both pilot and copilot ADIs.

– Approach must be made with EFIS in angular mode only. (For airplanes equipped with Collins EFIS-86B).

– While transmitting in HF, hydraulic fluid quantity indicator, battery temperature monitor and RMI information is not valid.

– The non-precision approaches using NDB course on the EFIS are not permitted. (For airplanes equipped with Bendix EFS-10A).

– The Fast/Slow indication is not valid for flaps 15° and 25°. (For airplanes equipped with Stall Warning Computer PN's C-81806-1 and C-81806-1 MOD. A).

– When the TCAS system is operational, the TCAS operator's manual must be on board or the material from the manual must be incorporated in the flight crew operating manual.

SECTION 4. FLIGHT MANUALS

2161. GENERAL. This section contains direction and guidance to be used by POI's in the evaluation of flight manuals for Parts 121 and 135 operators. FAR 121.141 requires that Part 121 operators maintain a current flight manual for each aircraft used in their air transportation operations. FAR 135.81(c) requires that Part 135 operators maintain a current flight manual (or the equivalent information for certain aircraft certified without a flight manual) for each aircraft used in their air transportation operations. FAR 91.9 requires that a flight manual (or the equivalent information for aircraft certified without a flight manual) be available in the aircraft for flightcrew personnel use and guidance during flight operations. To satisfy the Parts 121 and 135 requirements, operators may use either the approved airplane flight manual (AFM) or the approved rotorcraft flight manual (RFM), as applicable, or they may develop, obtain approval for, and use a company flight manual (CFM). AFM's or RFM's (as applicable) are acceptable for satisfying the FAR's in cases of small, simple aircraft. The FAA-preferred practice for all other aircraft, however, is for operators to develop a company flight manual (CFM) which includes procedures specifically tailored to the operator's operations. Operators who operate multiple aircraft types usually find it efficient to collect policies, procedures, and guidance common to all aircraft in a single manual such as a flight operations policy manual (FOPM). In this case, the CFM contains only those policies, procedures, and guidance that apply to the operation of the specific aircraft. POI's shall use this section as guidance when evaluating an operator's AFM's, RFM's, or CFM's.

2163. APPROVED AIRPLANE FLIGHT MANUALS (AFM's) OR APPROVED ROTORCRAFT FLIGHT MANUALS (RFM's). FAR 21.5(a) requires that aircraft manufacturers provide an approved airplane flight manual (AFM) or an approved rotorcraft flight manual (RFM) with each aircraft certified after March 1, 1979. Prior to this date, approved flight manuals were only required for transport category airplanes. Proposed AFM's and RFM's are reviewed by a flight manual review board (FMRB) and, based on the FMRB's recommendation, are approved by the manager of the applicable aircraft certification office (ACO) when the aircraft is certified.

A. *Approved Sections of AFM's and RFM's.* AFM's of transport category airplanes contain three sections which are reviewed by the FMRB and approved by the ACO. These are the procedures, performance data, and limitation sections. Weight and balance limits for transport category airplanes are given in the limitations section. AFM's of airplanes approved under Part 23 or rotorcraft approved under Part 27 or Part 29 contain four approved sections: procedures, performance data, limitations, and weight and balance.

(1) *Procedures Section of AFM's for Complex Aircraft.* The procedures section of an AFM of complex aircraft is typically not suitable for flightcrew use in air transportation operations. The certification regulations only require that the procedures section of an AFM or RFM contain specific and detailed procedural information related to the unique characteristics of the aircraft. These manuals are not required to contain each and every procedure necessary to operate the aircraft. Most manufacturers of complex aircraft develop and have approved only those procedures necessary to certify the aircraft. The certification regulations do not require that procedural information be expressed in sequential, step-by-step format suitable for publication in a checklist. AFM procedural information may be supplied in narrative format. POI's must ensure that operators have rewritten such AFM procedures to make them suitable for flightcrew use in Parts 121 and 135 operations.

(2) *Performance Data Section of AFM's for Complex Aircraft.* AFM's for complex aircraft contain extensive performance data sections. All performance information necessary to operate the aircraft in revenue operations is in this section. The AFM performance data section of a complex aircraft is typically not suitable for flightcrew use. This section is suitable for use by performance engineers.

(3) *Procedures and Performance Data Sections under Parts 23 and 27.* AFM's and RFM's of smaller, less complex aircraft certified under Part 23 and helicopters certified under Part 27 typically contain performance data and procedures sections that are suitable for flightcrew use. POI's of operators using these aircraft shall review the applicable manual to ensure that these sections are appropriate for flightcrew use in the operation being conducted.

B. *Unapproved Sections of AFM's and RFM's.* In addition to the approved sections of AFM's and RFM's, aircraft manufacturers often include other information

which does not require approval under the certification regulations in an AFM and RFM. For example, a manufacturer may include systems descriptions, recommended procedures, or correction factors for wet runways in an accepted section. The FMRB does not formally review this type of information and the ACO does not approve it. The ACO only acts on this type of information when some part of the information has been discovered to be unacceptable and then brought to the attention of the ACO.

C. *Use of AFM's or RFM's as Flight Manuals.* When an operator proposes to use an AFM or RFM as the required flight manual, the POI must review both the approved and unapproved sections of the manual. The POI must determine that the information in the AFM is presented in a manner that is suitable for use by the flightcrew, that it is compatible with the type of operation conducted by the operator, and that it contains all of the required information and procedures.

(1) *Certification Regulations Versus Operational Requirements.* Aircraft currently used in air transportation operations have been certified under the provisions of Parts 23, 25, 27, 29; SFAR 23 or SFAR 41; or preceding regulations such as SFAR 422, CAR 3, CAR 4, or Aero Bulletin 7; or, under the regulations of another government and accepted by the United States in accordance with FAR 21.29. The assumptions, limitations, and requirements of these aircraft certification regulations may differ from the operational requirements of Parts 121 and 135. The direction and guidance concerning procedures and performance which operators must provide to flightcrews for aircraft operations under Part 121 or Part 135 is normally more comprehensive than that published in an AFM or RFM. For example, basic crew coordination procedures such as standard altitude awareness call-outs during departures and approaches are not usually in an AFM or RFM.

(2) *Supplementary Information.* When a POI finds that the procedures or performance information published in an AFM or RFM is insufficient for the operation to be conducted, the POI shall require the operator to develop supplementary information and make it available to flight crewmembers. It is acceptable for operators using an AFM or RFM as the required flight manual to place supplementary information in a section of the GOM, such as a flight operations policy manual (FOPM) or a flight training manual.

D. *Aircraft Certified Without an AFM or RFM.* An AFM or RFM may not have been prepared for an airplane or rotorcraft certificated before March 1, 1979. FAR 91.31(b)(2) requires that the same information required to be in an AFM or RFM be available aboard these aircraft. The only practical method for meeting this requirement for aircraft of 6,000 pounds maximum take weight (MTOW) or more is for the operator to prepare a CFM which contains performance, procedures, and limitations. Some smaller aircraft may be operated satisfactorily with the information presented by placards in the aircraft.

2165. COMPANY FLIGHT MANUALS (CFM's). A CFM containing the required information and approved by the POI under the provisions of this handbook is an approved flight manual for the purposes of FAR 91.31(b)(1) or (2), FAR 121.141(b), or FAR 135.81(c). An approved CFM is the only flight manual that needs to be carried aboard an aircraft. POI's must evaluate an operator's CFM's using the guidance that follows.

A. *Identification as a Flight Manual.* POI's must ensure that a CFM is clearly marked as an approved flight manual for a specific operator. Sections of a CFM which contain approved information must also be clearly identified (see section 2, paragraph 2109 for specific guidance on identifying approved information).

B. *Approved Sections of a CFM.* POI's must ensure that the approved sections of a CFM contain all of the information that is required by the flightcrew to operate the aircraft. POI's should evaluate the approved sections of a CFM for the following:

(1) The procedures section of a CFM must contain all procedures required by the AFM or RFM and for each operation the operator conducts. As a minimum, the operator must include sufficient detail to allow a trained crew to safely and effectively operate the aircraft. The procedures section of the manual may be divided into subsections such as normal, nonnormal, and emergency procedures.

(2) The operator's performance data in a CFM must contain the data from the AFM or RFM and instructions on how to use that data. Operators may assign the responsibility for performing takeoff and landing data computations to flightcrew or ground personnel. The flightcrew must have access to adequate data in the cockpit, (including information for the specific airport and runway to be used) to perform the computations for which they are responsible. When takeoff and landing data is presented in tabular format for specific runways, it is often referred to as an airport analysis. Performance data may be

published under separate cover and be given titles such as performance manual or airport analysis. When performance data is published under separate cover, it must be identified as a portion of the CFM. Takeoff and landing performance data may be stored in an on-board or ground-based computer (see volume 4, chapter 3 for guidance on the approval of aircraft performance and airport data acquisition systems).

(3) The limitations section of a CFM must be clearly identified as FAA approved. The limitations section of a CFM must contain each limitation which is contained in the AFM or RFM (see paragraph 2185 that follows for further details).

C. *Accepted Sections of a CFM.* Accepted sections of a CFM may contain supplementary information such as aircraft and systems descriptions, an expanded explanation of procedures, special policies and procedures, and other selected topics pertinent to operation of the aircraft type. The accepted sections of a CFM must conform to the regulations and safe operating practices but do not need to conform to corresponding sections of the AFM or RFM, either in format or content. POI's should ensure that the CFM developed by or for the operator contains sufficient explanation and guidance for flightcrew use in the safe operation of the particular aircraft type. Background information or information that is not specific to the operation of the particular aircraft should be placed in a section of the GOM, rather than in a supplementary section of the CFM.

2167. **AIRCRAFT SYSTEMS DESCRIPTION.** Operators must provide crewmembers with a systems description of an aircraft's systems and components that contains sufficient detail to allow flight crewmembers to adequately understand and perform all procedures in the flight manual. AFM's, RFM's, and CFM's may or may not contain a systems description section. The aircraft systems description section of a manual is "accepted" as opposed to "approved." Operators may choose to place the systems description information in an accepted section of a CFM or in a section of the GOM, such as a training manual.

2169. **PROCEDURES.** POI's should not construe procedures published in an AFM or RFM to be the only or best means of accomplishing a specific objective. Because AFM or RFM procedures are formulated primarily for aircraft certification purposes, POI's should encourage operators to develop procedures appropriate to revenue operations for inclusion in a CFM.

A. Procedures incorporated in a CFM should be tailored by the operator to accommodate the operator's type of operation, fleet standardization objectives, and cockpit management objectives. As an operator's operations become more complex, it is progressively more important to include detailed guidance in the flight manual, which is specifically tailored to the operator's operations.

B. Aircraft which have been modified by supplemental type certificate (STC) or by field approval (FAA Form 337) may require different procedures than unmodified aircraft. POI's must coordinate approval of procedures with PMI's to ensure modifications are accounted for in the operator's procedures.

C. Procedural information included in a CFM must be presented in a step-by-step format. A procedural step in an AFM or RFM procedure must be included in the equivalent CFM procedure, unless the POI approves the deletion through the process described in subparagraph I that follows.

D. Operators are responsible for developing effective standard operating procedures. The development process for standard operating procedures consists of the operator or other qualified party (such as the manufacturer) conducting a painstaking task analysis of the man-machine-environment relationship. Although this analysis is time consuming and expensive, it is necessary to meet the required level of safety in air transport operations. General guidelines for POI's to use when evaluating these procedures are contained in paragraph 2171 that follows. Specific guidelines for developing aircraft operating procedures are almost nonexistent. This chapter contains the best information available at the time of publication. POI's should bring the information in this chapter to the operator's attention. Further guidance will be added to this chapter as it becomes available. POI's should encourage those operators that do not have extensive experience in developing their own procedures to follow the manufacturer's recommendations.

E. POI's should ensure that operators standardize their operating procedures both within and across aircraft types to the greatest extent possible. POI's should make operators aware of the following information concerning procedures for standardization.

(1) Standardized procedures promote understanding and effective communications between crewmembers. Research has shown that standardized procedures and effective communications are significant factors in reducing

FLT STDRDS

inspectors to effectively act as evaluators rather than as participants.

D. *Inspector, Examiner, and Safety Pilot Duty Positions.* A qualified and current pilot must occupy a pilot seat and act as safety pilot on all flight tests conducted in an aircraft. The preferred procedure is for the operator to provide a qualified instructor pilot or check airman to act as the safety pilot and pilot-in-command. Onaircraft equipped with jump seats, inspectors will usually occupy a jump seat so that they can evaluate the crew's interaction. However, when necessary a qualified and current inspector may act as a safety pilot and occupy a pilot's position on pilot flight tests. This provision will normally be limited to those families of aircraft in which it is not possible for the inspector to evaluate from a jump seat. On other occasions, an inspector may be the only qualified individual to act as the safety pilot. This may be appropriate when an operator is introducing a new aircraft type or when the aircraft is a type not typically used in Part 121 or Part 135 operations. In such circumstances, an inspector may act as safety pilot and occupy a pilot position during the flight test. When an examiner conducts a pilot flight test in an aircraft, the examiner will usually act as the safety pilot.

15. AIRCRAFT OPERATING MANUALS. The FAR's frequently reference the FAA Approved Flight Manual (AFM) in matters pertaining to the certification of aircrew members. Many operators use the AFM as an operating manual. Most Part 121 operators and many Part 135 operators, however, extract the information from the approved sections of the AFM and place it in a company aircraft operating manual. Operators may modify AFM procedures with the approval of the POI. Under these circumstances operators do not normally provide their crewmembers access to the AFM. Inspectors and examiners shall use the company-prepared aircraft operating manual instead of the AFM for airman certification purposes. Inspectors should be alert to deficiencies in the operator's manuals and procedures and for conflicts between company manuals and the AFM. When conflicts or deficiencies are observed, they shall be reported to the POI.

17. TESTING SEQUENCE AND TIME LIMITS.

A. *Test Sequence.* For all flight crewmembers, the phases of the certification process must be completed in the following sequence:

(1) Written test
(2) Oral test
(3) Flight test

B. Multiple Segment Flight Tests. When a combination of a flight simulator and aircraft is used for a flight test, the flight simulator segment must be completed before the airplane segment.

C. *Completion of Training Before the Oral Test.* Applicants must be adequately prepared for each phase of the testing process. The applicant must complete ground training including systems integration training before the oral test is administered. Systems integration training may be conducted using a flight simulator or a flight training device, however, it is not considered to be flight training. When flight training is conducted entirely in an aircraft, all training must be completed before the oral test. When circumstances make literal compliance with these policies impractical, the POI may approve alternate provisions.

D. *Completion of Training Before the Flight Test.* When a flight test is conducted either entirely in a flight simulator or in an aircraft, all flight training must be completed before the flight test is conducted. When a flight test is conducted with a combination of flight simulator and aircraft segments, only the simulator training must be completed before the simulator segment of the flight test is conducted. The aircraft portion of the flight training does not need to be conducted until after the simulator segment of the flight test has been completed.

E. *Time Limits.* The flight test phase must be completed within 60 days of completion of the oral test. If a flight test is conducted with a combination of flight simulator and aircraft segments, the aircraft segment must be completed within 30 days of the simulator segment.

F. *Extending Time Limits.* If an unplanned delay beyond the control of the operator occurs, the oral test may be repeated to extend the 60-day limit between the oral and flight test phases. The 30-day limit between the simulator segment and the aircraft segment may not be extended. For example, an applicant completed the oral test on July 1 and the simulator portion of a two-segment flight test on August 10. The aircraft portion of the flight test, however, could not be scheduled until September 5. In this case, a repeated oral test conducted between August 10 and September 5 would extend the time limits and both the 30- and 60-day limits would be satisfied.

18. - 26. RESERVED.

[PAGES 5-4 THROUGH 5-6 RESERVED]